# SUMMARY OF THYROID

## INDEX



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*kindly share!*

# Goiter

- Cong. Goiter.
- Inflam. Goiter. (Thyroiditis)
- Neoplastic Goiter

## Simple Goiter

Non inflam., non neoplastic & non toxic enlarg. of thyroid gl. (euthyroid) due to

### $I_2$ Defeciency (100-125 µgm / day)

- **Absolute ↓:** water supply as in Oasis & mountains.
- **Relative ↓:** during stress periods of life as puberty - pregnancy - lactation.

### Defective Synthesis of Th. hormones

- Goitrogenic subst.
  1) Diet: Cabbage - Cauliflower
  2) Water poluotion.
  3) Drugs containing $I_2$:
     a) Asthmatic pts.
     b) Anti-thyroid.
- Enzyme defeciency

## Toxic Goiter

| | 1ry Toxic Goiter (Grave's ds.) | 2ry Toxic Goiter (Plummer's ds.) | Solitary Toxic Nodule |
|---|---|---|---|
| Age | Young ♀ 20 - 30 | Middle age ♀ 30 - 40 | Occur at any age. |
| Etiology | Type V HS | Longstanding SNG. | - SNG<br>- functioning follicular adenoma |
| Onset | Sudden | Gradual | Gradual |
| Course | Fluctuating. | Progressive. | Progressive |
| Cl./P | • Acropathy<br>• Pretibial myxedema<br>• True exophthalmos. | False exophthalmos.<br>Invest.: as Grave's but Th. scan *shows hot nodule dt active nodules or inter-nodular nodular t.* | |
| Main manifest. | • Nervous + Metabolic<br>• HSM + LN$^{++}$ | • CVS dt old age. | • Old → CVS<br>• Young → CNS |
| Thyroid gland | • Diffuse ++<br>• Mass with toxicity.<br>• hyper-vascularity. | • Nodular & firm.<br>• Mass b4 toxicity. | • Single nodule in normal gland. |
| TTT. | • Mainly Medical.<br>• If failed or RSG:<br>< 45 ys. = STT.<br>> 45 ys. = $I^{131}$ | • STT after prep.<br>• $I^{131}$ if HF. | $I^{131}$ of choice or hemithyroidectomy after prep. |

# Types of Simple Goiter

**"Stress → relative ↓ of $I_2$ → ↓$T_3$ $T_4$ ↑ TSH → Hyperplasia & Hypertrophy of the gl. "**

| | Simple Physiological Goiter (Hyper-plastic -Parynchymatous – Diffuse) | Colloid Goiter | SNG (Simple Nodular goiter) |
|---|---|---|---|
| **Etiology** | If stress is over → Complete involution (uncommon) or incomplete involution → parenchymatous goiter | • If stress is prolonged → gland becomes exhausted → hyper-involution<br>• $I_2$ therapy → follicles are distended with thyroglobulin → Colloid Goitre. | • If stress is repeated → Repeated fluctuation of TSH → cycles of hyperplasia & involution → hge & central necrosis + fibrous t. around the nodules.<br>• **Forms =** SMNG or Solitary Nodule. |
| **Cl./P** | • Female in puberty.<br>• Pregnancy & Location. | • Female 20 – 30 ys. | • Females 30 – 40 ys. (M/C type)<br>• Mic: multiple nodules = incomp. fibrous capsule. |
| **Symptoms** | Painless mild enlargement of gland. | Pressure on trachea. | • Painless swelling in neck & Cosmetic disfig. |
| **Signs** | **General =** NAD. (no signs of toxicity) | **General =** NAD. (no signs of toxicity) | **General = NAD.** |
| | **Local = Thyroid Gland:**<br>• **Size** → mild ++.<br>• **Shape** → Diffuse.<br>• **Surface** → smooth - mobile, symmetric.<br>• **Consist.** → fleshy.<br>• No toxic, pressure or infiltrative signs. | **Local = Thyroid Gland:**<br>• **Size** → Mod. or maybe huge.<br>• **Shape** → Diffuse.<br>• **Surface** → smooth – symmetrical.<br>• **Consist.** → Soft.<br>**Invest. = TNT + Laryngoscopy**<br>1) $T_3$ & $T_4$ are (N) + slight ↑ in TSH.<br>2) Neck US → solid or cystic esp. if STN? / diffuse or nodular.<br>3) Th. Scan → cold dr fibrous t.<br>4) **Laryngoscopy** for MLI (idiopathic VC paralysis)<br>5) **Biopsy** → to exclude malig. (histological surprise) | **Local = Thyroid Gland:**<br>• **Site** →lower part of the neck.<br>• **Size** →mild to huge.<br>• **Shape** → butterfly or irregular.<br>• **Surface** → micro nodular. **Skin over** → (N)<br>• **Sp. Ccc.** → moves with deglutition.<br>• **Consist.** → firm or fleshy.<br>**Complications:**<br>• **2 changes**→ Toxic in 25 % or Malig. (FTC)<br>• 2 → Cystic degen. + Hge → *s. pain & suffocation dt compr. on trachea + reflex spasm of the pre-tracheal ms. →impaired venous drainage of the lx & laryngeal edema!*<br>• **Pressure → Mediastinal $** |
| **TTT.** | • Reassurance. (venus neck)<br>• L-thyroxine. (0.3 mg/day) | • L-thyroxine → ↓ its size → th. trial.<br>• STT for huge goiter or failed medical. | • STT + L-thyroxine till menopause to avoid recurrence!<br>• Total thyroidectomy to avoid recurrence & avoid completion thyroidectomy in histological surprise.<br>• Total lobectomy of ! affected part + STL for ! other part.<br>• Medical only if the nodules < 1cm. |

# Grave's Disease

## Cl./P

**Auto- immune ds. = Type V hypersensitivity:**

- Ag = TSH rs on folicular cells.
- Ab = TSH-RAb (IgG) → cross antigenicity with Eye – ms. – skin.

## Invest.

**TNT + Laryngoscopy**

1) ↑ $T_3$, $T_4$ + ↓ TSH.
2) **TRH Test** → IV TRF doesn't ↑ TSH as its suppressed by $T_3$, $T_4$.
2) **Neck US** → diffuse or nodular?
3) **Th. scan** → **hot scan.**
4) **Laryngoscope** → for MLI b4 surgery (idiopathic VC paralysis)
5) **Misc.** → ECG - ↓Cholest. ↑ creatinine - Glycusoria in sever cases. (lag storage curve)

## Thyroid

- **Size** → lower neck.
- **Size** → slight to mod. ++
- **Shape** → symetrical.
- **Surface** → smooth.
- **Consist.** → Soft.
- **Sp. ccc.** → moves up with deglutation.
- **Skin overlynig** → warm.
- **Edge** → well defined.
- **Pulsations & thrill at the upper pole.**

## Symptoms

### Systemic

1) **Metabolic** → ↑ Appetite but ↓ Wt, ↑ sweating
Can't tolerate hot weather.

2) **Nervous** → Insomnia, tremors, Irrit., hyper-reflexia.

3) **CVS dt ↑ senstivity to circ. CA:**
   - **Rate**: Tachycardia (palpitation) + sleeping pulse > 90.
   - **CCC.**: ↑ SBP + ↓DBP or normal dt periph. VD → bounding pulse. "Water-hammer"
   - **Rythm**: All types of Arrhythmia but not HB or VF.

4) **GIT** → loose stools . (hyper-defecation)

5) **Sexual** → Menorrhagia then amen, Impotence in ♂

6) **Urinary** → Polyurea.

7) **Bone** → Osteoporosis → bony aches.

### Triad

**Myopathy (px.)**
(Deltoid & Quadriceps).

**Dermopathy**

- Moist, warm & sweaty.
- Clubbing. (Th. acropathy)
- **Pretibial myxedema.**
- Soft & brittle nails.
- Edema of LL.
(Pitting then Non pitting)

**Exophthalmopathy**
(True) → Diplopia.

# Treatment of Toxic Goiter

| | Medical | Surgical | $I^{131}$ |
|---|---|---|---|
| **Indic.** | 1) 1ry Thyrotoxicosis. (pt < 45 ys)<br>2) Preparation for surgery.<br>3) Contraindications for surgery. | 1) 2ry thyrotoxicosis. (TNG & STN)<br>2) Diffuse toxic goiter if:<br>• Failed medical (> 2ms. or S/E Neom. – Relapse after 1.5 ys. – Complications)<br>• Large diffuse toxic goiter.<br>• RSG. | 1) 1ry thyrotoxicosis:<br>• pt > 45 yr + failed medical.<br>• High risk unfit patient.<br>2) Recurrent Thyrotoxicosis.<br>3) STN if pt. >45 ys. |
| **Procedure** | **1) Neomercazole → (-) Peroxidase enzyme**<br>• (-) Oxidation of iodide to iodine.<br>• (-) Binding of iodine with tyrosine.<br>• (-) TSH R Ab production.<br>*1st 2ms 10 mg/8 hrs. till euthyroid then 5mg/8 hrs.*<br>**2) Prophyl thiouracil → (-) peroxidase enzyme**<br>• (-) periph. conversion of $T_4$ to $T_3$.<br>• Safer in preg. as it crosses placenta to a ↓ extent.<br>***"effect starts to appear after 2 wks, till depletion of the already formed thyroid h. → cont. TTT. for 1.5 ys"***<br>**3) β Blockers (Indral)**<br>• protect the heart & (-) periph. conversion of $T_4$ to $T_3$.<br>• Given with Neomercazole in the 1st 2 wks. till its effect start to appear & then cont. for 2ms till euthyroid.<br>• Rapid preparation for Toxic RSG surgery. | **Sub-Total Thyroidectomy after prep.**<br>*"Aim is to ↓the mass of antigenic gl. → ↓TSH R Ab production!"*<br>**Pre-op. preparation:**<br>i) Neomercazol for 2 ms. till Euthyroid.<br>ii) Lugol's iodine at the last 2 wks. to (-) TSH & protease enzyme → colloid accumulates → compress blood vs. → firm gl. & ↓ vascularity.<br>iii) β blockers → few days b4 & 1 wk. post op.<br>(Only line of prep. For Toxic RSG **or** Surgical emergency with Grave's ds.) | $I^{131}$ Emits β irradiation (low penetrating power so its ineffective in TNG dt fibrosis)<br>↓<br>Destroys the major part of the gland without affecting the surrounding t.<br>↓<br>Effect appears after 2-3 ms. |
| **Disadv.** | 1) Prolonged ttt. + HFR! (50 – 60 ys.)<br>2) Impossible to predict when is remission.<br>3) Toxic RSG enlarges → Mediastinal $!<br>**4) S/E of Neomercazole:**<br>• Aplastic anemia or agranuocytosis → stop the drug + give Penicillin + fresh blood + Vit. $B_6$<br>• HS → skin rash & hematuria & liver toxicity. | **Special problems in general:**<br>1) **Child** → Surgery is preferred *as medical ttt. has ↑recurrence rate + + $I^{131}$ is carcinogenic + S/E of Neom.*<br>2) **Pregnancy:**<br>1st trim.: Prophy-lthiouracil *doesn't cross placenta!*<br>2nd trim.: Thyroidectomy<br>3rd trim.: medical | 1) **Over dose** → hypothyroidism after 10 ys. or even with (N) dose after 20 ys.<br>2) **Low dose** → Recurrence.<br>3) **Carcinogenic** after 15-20 ys. so avoid using before age of 45 ys.<br>4) **Teratogenic** # in preg. & lactation. |

**MEDICAL TTT**

2 ms. Neomercazol + Inderal → Neomercazol till Spont. remission

**SURGERY**

2 ms. Neomercazol + Inderal → 2 Wks. Neomercazol + Lugol → Surgery

**URGENT SURGERY**

4 days Inderal → Surgery → 2 Wks Inderal

# EXOPHTHALMOS

It is Protrusion of the eye ball due to thyroid disease. (ie. Thyroid proptosis)

- ✓ **False** → Due to spasm of the Muller muscle.
- ✓ **True** → Due to (Exophthalmos Producing Factor) EPF. (part of the Auto-immune ds.)

## CLINICAL DEGREES:

- **R**osenbach's sing → Tremors on closing eye lids.
- **S**tellwag's sign → **S**tarring look + Infrequent blinking
- Von **G**raef's sign → Lid la**g** when th ept. Is asked to look gradually downwards without moving his head.
- Dal**rym**ple sign → white **rim** of sclera between cornea & upper eye lid.
- Jo**ff**ry's sign → Lack of wrinkling of **f**orehead on looking upwards.
- Mobius sign → failure of convergence.

## TREATMENT:

1) Head up during sleep.

2) Diuretics: → ↓ retro-orbital edema.

3) Eye drops at day & by Ointment at night.

4) Prednisolone (local) → risky if there is venous congestion.

5) Lateral Tarsorraphy Or Orbital decompression.

Treatment thyrotoxicosis

1. Antithyroid drugs +small dose of thyroxine → ↓TSH (EPF follow TSH).
2. If STT → exophthalmos should be static for 6 ms.

# Thyroid Carcinoma

| | Differentiated (80%) | | Un-diff. | Medullary Carcinoma |
|---|---|---|---|---|
| | **Papillary** (60%) | **Follicular** (20%) | **Anaplastic** (10%) | |
| **PDF** | 1) Hx. of neck radiation in childhood.<br>2) Hashimotos' Thyroiditis.<br>3) Genetic: fusion oncogene. | 1) Long standing SMNG.<br>2) Folicular Adenoma. | | Origin = Para-follicular. (C cells)<br>PDF = mutation in RET proto-oncogene in familial MTC. |
| **Age** | Young age. (20 ys) | Middle age (40 ys.) | Old age (60 ys.) | Sporadic (M/C): ***Old age.*** ***Aggressive.*** — Familial: ***Young*** *age.* *MEN II or non-MEN (AD)* |
| **Path. Mac.** | • Solitary thyroid nodule.<br>• Multi- centeric dt intra-glandular lymph. spread. | • Solitary thyroid nodule.<br>• Diffuse, irregular & firm mass. | • Diffuse, hard, irregular, rapidly growing & infilt. | As FTC<br>• Diffuse, irregular & frim mass.<br>• Localized slowly gr. Nodule. |
| **Mic.** | • Malig. cells with papillary proj.<br>• Stroma → psammoma bodies.<br>• Pale empty nuclei "Orphan Annie-eyed Nuclei" | • Malig. cells = cubical or columnar.<br>• Arranged in incomplete acini or f.<br>• Capsular & vascular invasion. | • Undiff. spindle malig. cells.<br>• Arranged in sheets.<br>• Separated by fibrous t. | • Malig. spindle shaped cells.<br>• Stroma → Amyloid material dt deg. Calcitonin & Seritonin. |
| **Spread (Mainly)** | Lymphatic.<br>(Cx. LN++) | Blood to Skull:<br>• Solitary – Painful – Pulsating.<br>• Osteo-lytic. | Direct<br>(in-operable) | Lymph → Cx. then Mediastinal LN<br>Blood. (common) |
| TSH dependency | +++ | + | - | |
| **Prognosis** | Very good | Favorable | Poor | |
| **C/P & Comp.** (Variable) | • Solitary thyroid Nodule.<br>• May change to Anaplastic. | • Solitary thyroid Nodule.<br>• Longstanding SMNG e recent onset of pr. manifest. (Mediastinal $)<br>• Pain referred to ear via arnold's n.<br>• hist. surprise! after STT for SMNG. | • Goiter of Recent onset with pr. manifest. | Goiter + hormonal:<br>• 5HT → Diarrhea + BS + flushing.<br>• Calcitonin → hypo-calcemia. |
| **Occult** | • Cx. LN metastasis = Lat. aberrant thyroid. | • Distant metastases to Skull. | | • Associated with MEN IIa/ IIb |

# Treatment of Thyroid Carcinoma

| Papillary | Follicular | Anaplastic | Medullary C. |
|---|---|---|---|
| **Total thyroidectomy??** + L-thyroxine (0.2 mg/day) to suppress TSH to < 0.1 IU<br>*Even if in 1 lobe:*<br>• *Multi-centeric.*<br>• *Easily follow up recurrence by Thyro-globulin.*<br>• *Identify & ttt. of metastasis by post-op $I^{131}$*<br>➢ **Hemi-thyroidectomy if < 1 cm.** | Total thyroidectomy* + L-thyroxine (0.2 mg/day) to suppress TSH<br>*: even if its small to the uptake of $I^{131}$ by the metastatic nodules to know whether its functioning or not.<br>➢ **Hemi-thyroidectomy if < 1 cm.** | Total Thyroidectomy + L-thyroxine | Total Thyroidectomy<br>• If no Cx. LN ++ → prophylactic BND.<br>• If Cx. LN ++ → Modified BND. |
| • If no LN++ → follow up.<br>✓ If few → Cherry picking.<br>✓ If extensive → Modified BND. | TTT. of Blood metastasis<br>• If functioning → $I^{131}$<br>• If non-functioning → ext. rad. | **Mostly Inoperable** → Palliative isthemctomy + Ext. radiation. | **In MEN $: Pheochromocytoma should be excluded 1st b4 Thyroidectomy by (Urinary VMA & MRI abd. if VMA +ve) to avoid bouts of HTN → fatal hge.** |

- **Thyroid gland** → Tender, hard, fixed & irregular.
- **NB: Sternomastoid tugging** & loss of rocking mov. → earliest sign.
  **Bery's sign** → absent carotid pulsations.
- **LN** → early: hard, mobile.
  late: fixed.

## Investigations

### 1ry

**1) Biopsy**

A) **FNAC** = 90 % accurate, but can't diff. bet Follicular adenoma & FTC.

B) **Excision biopsy** = lobectomy + isthmectomy. (Most diag.)

C) **Frozen section biopsy.**

**2) Neck US** → Solid or cystic nodules ?!

**3) Th. Scan** → Malig. nodules are cold.
(Only10 % of cold nodules are malig.).

### 2ries

- **PTC** → CT neck for Cx. LN ++ & to asses operability.
- **FTC** → X-ray Neck, Chest, Skull & spine b4 bone scan.
- **AC** → CT to asses operability.
- **Laryngoscope** for RLN invasion.

### Tumor marker

- PTC & FTC → s. Thyro globulin
- MTC → Calcitonin

# THYROIDITIS

| | HASHIMOTO'S | REIDEL'S (WOODY) | SUB-ACUTE (DEQUERVAIN'S) |
|---|---|---|---|
| **ETIOLOGY** | Auto-immune type IV hyper-sensitivity. (3 كل حاجة) | **COLLAGEN DS.** → Replacing thyroid t. with extensive fibrous t.→ infiltrates the capsule & adj. structure → pr. manifest. | **VIRAL.** (Mumps) |
| **CL./P** | **AS SMNG BUT WITH3 DIFF.:**<br>1) Age: females at menopause.<br>2) Hashitoxicosis then myxedema.<br>3) Severe pr. manifestations.<br>**COMPL.**<br>1) hypothyroidism. (Myxedema)<br>2) PTC.<br>3) Lymphoma. "NHL" | 1) Very hard Goiter. (fixed)<br>2) Pressure manifest. (SEVER)<br>3) Hypo-thyroidism. | Follow URTI →FAHM + Thyroid swelling firm, tender, irregular, painful causing dysphagia & pr. manifestations<br>Clinical stages:<br>• 1st m. → hyper-thyroidism.<br>• 2nd ms. → Euthyroid.<br>• 3rd & 4th → hypo-thyroid.<br>• 5th & 6th → Recovery. |
| **INVEST** | **AS SMNG + :**<br>1) Anti-Thyroglobulin Abs.<br>2) Anti-microsmal Abs.<br>3) FNC to diff. it from PTC & SNG → lymph. infiltration + Askanazy cells. (metaplastic follicular eosinophilic cells)<br>**DD= SMNG** | 1) **↓ $T_3$, $T_4$ & TSH** → hypo-thyroidism.<br>2) **SONAR** → hypo-echoic dt ↓ bl. supply.<br>3) **FNC?!** OR **ISTHMECTOMY** for biopsy.<br>4) **$I^{131}$** → No uptake dt extensive fibrous t.<br>5) **CT SCAN** → extension of fibrous t. outside ! capsule.<br>**DD= ANAPLASTIC TC.** | 1) $T_3$, $T_4$ & TSH → acc. to stage.<br>2) Th. scan → ↓ uptake dt inflam.<br>3) Diagnostic Therapeutic test → rapid response to Prednisolone. (As Amoebic liver abscess)<br>4) ↑ ESR. |
| **TTT.** | 1) Replacement th. + follow up.<br>2) Thyroidectomy if large → pr. manifest. or **FNC** is suspicious. | 1) Isthmectomy to relieve pr. symptoms + Biopsy. *(no thyroidectomy as its closely related to the surr.)*<br>2) High dose Steroids.<br>3) L-thyroxine for hypothyroidism. | 1) Self-limiting after 6 ms.<br>2) If sever pain → Prednisolone. |

# MISCELLEANEOUS

## THYROID GLAND PHYSIOLOGY: (MCQ)

1) **TRAPPING** of inorganic iodide from blood. (requires ATP)

2) **OXIDATION** of iodide to iodine by perixodiase enzemy.

3) Binding of iodine with tyrosine by tyrosinase to form mono & di-iodo tyrosinase. (**ORGANIFICATION**)

4) **COUPLING** of mono & di-iodotyrosinase to form $T_3$ & $T_4$ → unite with thyroglobulin → stored in follicles.

## BENIGN TUMORS: (FOLLICULAR ADENOMA)

| | |
|---|---|
| Cl./P | Solitary Thyroid Nodule. (STN) |
| Complications | Cystic degen. – hge – malig. transf. (FTC) |
| Invest. | • Th. function test<br>• Neck US.<br>• FNAC → can't diff. it from FTC. |
| TTT. | Lobetomy + Isthemectomy. |

## MEN II A & B.

1) **MEN II A** = Parathyroid hyperplasia – Pheocromocytoma – MTC.

2) **MEN II B** = Pheocromocytoma – MTC – Marfinoid features – Mucosal neuromas. (No parathyroid)

## CONG. ANOMALIES

1) Ectopic Thyroid: Lingual – Median – Retro-sternal ectopic thyroid.

2) Cong. Aplasia or hypoplasia.

3) Physiological anomalies → dt peri-oxidase enzyme deficiency in the gland. (Pendred's $ = Goiter + Deafness + MR)

4) Thyro-glossal cyst & fistula. (see general)

| | Lingual Thyroid | Median Ectopic Thyroid |
|---|---|---|
| Cl./P | • Tongue swelling.<br>• Impaired speech, dysphagia & resp. obst. | Solid neck swelling moving up & down with deglutition. |
| Inv. | Th. scan is a must as it may be the only thyroid t. in the body. | |
| DD. | | Thyroglossal cyst. |
| TTT. | • Partially ectopic → Excision.<br>• Totally ectopic → L-thyroxine.<br>(If failed → Excision + replacement th.) | • Partially ectopic → Excision.<br>• Totally ectopic → leave it. |